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ABSTRACT

Compared was the relative predictive power of learning potential (LP) and IQ measures for 54 low-income Spanish-speaking students (grades 2 through 6) in a transitional bilingual urban school. Ss were administered the Raven LP procedure, the Semantic Test of Intelligence, the Wechsler Intelligence Scale for Children (WISC) in Spanish, and the WISC Vocabulary Subtest in Spanish and English. Before and after participation in an electricity science curriculum unit taught in Spanish, Ss also took an electricity unity evaluation instrument. Results indicated that posttraining Raven LP scores significantly predicted performance on the minimally verbal symbolic level of the electricity instrument, that IQ scores were not positively related to postteaching electricity scores, and that the LP procedures resulted in increased performance levels on a reasoning task. (LH)

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AN EDUCATIONAL TEST OF LEARNING POTENTIAL ASSESSMENT

WITH SPANISH-SPEAKING YOUTH

Abstract

The learning potential (LP) procedure represents an alternative method of measuring the general ability of Spanish-speaking students who tend to score low on traditional IQ tests. Postteaching scores on an electricity curriculum unit test were used as criteria to compare the relative predictive power of LP and IQ measures for Spanish-speaking students. Subjects were administered the Raven LP procedure, the Semantic Test of Intelligence, the WISC Performance Scale in Spanish, and the WISC Vocabulary Subtest in Spanish and English. Before and after participation in an electricity unit, subjects took the electricity unit evaluation instrument. Posttraining Raven LP scores significantly predicted performance on the minimally verbal symbolic level of the electricity instrument. IQ scores were not positively related to postteaching electricity scores. The LP procedure resulted in increased levels of performance on a reasoning task.

AN EDUCATIONAL TEST OF LEARNING POTENTIAL ASSESSMENT WITH SPANISH-SPEAKING YOUTH [1]

Milton Budoff, Louise Corman, and Alex Gimon

Research Institute for Educational Problems

Budoff, Gimon, and Corman (1974) have set forth a rationale for an alternative method to the IQ test for measuring intelligence of Spanish-speaking children, where this construct is defined as the ability to learn and profit from appropriate experience. Learning potential (LP) assessment utilizes a three-stage procedure which includes pre-and posttraining administrations of a nonverbal problem solving task with training relevant to the tasks interpolated. The entire procedure may be group or individually administered. The strategy is based on the premise that low income and/or minority group children differ in familiarity and experience with particular tasks, have a negative expectancy of success while taking tests, and are less effective in spontaneously developing strategies appropriate to solving the often strange problems on a test. Training helps these children develop a sense of competence on the task by providing them with problem-relevant strategies in a context of positive support.

Posttraining scores are indicative of general ability to reason. The posttraining score is hypothesized to relate to students' performance on tasks or curricula which permit them to operate in their areas of conceptual or cognitive strength, as opposed to areas of weakness, such as the verbal-conceptual domain predicted by IQ scores. The purpose of the present study was to test this hypothesis with Spanish-speaking children.

Previous research with IQ-defined EMRs (Budoff & Corman, in press)

has shown that pretraining learning potential scores were related to verbally-biased IQ scores and to social and demographic factors associated with high academic risk. Posttraining scores were found to be related to other performance ability measures, e.g., WISC performance IQ, but were not related to academic risk factors.

Similar findings have been obtained with Spanish-speaking children. Budoff, et al. (1974) administered learning potential and IQ measures to 188 Spanish-speaking children in grades 1 to 6. The WISC administered in Spanish yielded low estimates of intellectual ability (mean performance IQ score = 86 $\pm$ 15; verbal IQ, 77 $\pm$ 17), and depicted the students as slow learners or mentally retarded. The pretraining learning potential score on Raven's Progressive Matrices (1958) was correlated significantly with the WISC IQ scores and averaged at the 25th percentile for the chronological age of these subjects. By contrast, the average posttraining score was at the 67th percentile. The correlation of posttraining scores with the WISC verbal score was not significant, while there continued to be a strong relationship to WISC performance IQ.

Budoff, et al. (1974) used a standardized achievement test, the Inter-American Test of General Abilities (IAGAS), as a criterion measure to compare the relative predictive power of IQ and LP scores. The IAGAS measures verbal, nonverbal, and numerical achievement in Spanish and English. Posttraining LP scores, as well as PIQ, were significantly related to nonverbal and numeric achievement scores in both Spanish and English, while WISC verbal IQs predicted only verbal achievement in the same language. Hausman (1972) also reported a significant relationship between LP scores and achievement with

samples of Mexican-American children. Interpretation of these findings, however, must take into account that any academic achievement criterion of validity is inadequate for children who perform so poorly in Spanish and English achievements. The mean achievement level of the sample in the Budoff, et. al (1974) study was below normative expectation in Spanish and English. To compare the relative power of IQ and LP measurement, the criterion should permit children to display their reasoning capability in situations not adversely affected by poor scholastic attainments.

The present study employs this kind of criterion. Budoff, Merkin, and Harrison (1971) developed a model by which to test the relative power of IQ and LP assessment with IQ-defined educable mental retardates on educationally relevant curriculum units. They reasoned that IQ-defined educable mental retardates who profited markedly from the learning potential training would also learn when the curriculum permitted maximal reliance on their nonverbal reasoning ability and a minimal demand on their poor verbal-expressive competence. To test the educational significance of learning potential scores with educable mentally retarded and average-IQ, low income students, the students were taught concepts of electricity by manipulating flashlight batteries, bulbs, and copper wires. The investigators formulated an evaluation instrument that required a minimally verbal response (pointing or one word answers) in a multiple choice format and determined the students' acquisition of knowledge in a pre-to-postteaching design. The students were also asked to give reasons for their choices for a subsample of items. The investigators hypothesized that these students' ability to provide reasons for their choice would be less adequate than their empirical understanding of the problems.

Results of the Budoff, et al. (1971) study indicated that high able EMR

students, by the learning potential criterion, learned more from the electricity unit than students who had not improved their LP scores following training on the learning potential procedure. Performance on the electricity evaluation instrument differentiated between the special and regular class students prior to teaching. Following teaching, special and regular class children could be differentiated only on the basis of their learning potential status, not their class placement. However, special class students were significantly poorer than their regular class agemates in explaining the reasons for their correct minimally verbal responses. This difference in performance was consonant with the low IQ scores of special class students.

The present study employs the same model to test the educational significance of learning potential assessment with Spanish-speaking students. The electricity unit was translated and taught in Spanish and the evaluation test was administered in Spanish prior to and following the course. This instrument allowed comparisons at two levels of abstraction within a minimally and maximally verbal mode of response. The minimally verbal sections of the test required responses to actual electrical setups mounted on pegboards (concrete level) and to electrical problems presented as two-dimensional drawings (representational or symbolic level). In the verbal sections of the test the students were asked to explain in Spanish the reasons for their choices to a subset of pegboard items. Responses were scored for verbal-descriptive and verbal-conceptual competence.

This study hypothesized that postteaching scores on the minimally verbal section of the electricity test would be predicted by posttraining learning potential scores but not by IQ scores. Verbal explanation scores on the electricity instrument following teaching were expected to be more highly

related to scores on a language-related training-based measure than to WISC vocabulary scores.

Method

Subjects

Data were collected in a transitional bilingual school in an urban community in New England from March, 1972, to May, 1973. Fifty-four Spanish-speaking students in classes equivalent to second through sixth grades were administered the WISC IQ test, the Semantic Test of Intelligance, and Raven's Progressive Matrices learning potential assessment in Spanish. After these tests had been given, students participated in the electricity classes as part of their general science requirement. The age range of this group was 6-7 to 13-8 years, with a mean age of 9-10 (±1-9) years. The sample consisted of 32 boys and 22 girls. The mean WISC full scale IQ in Spanish (86 ± 18) indicated that many would be psychometrically classified as "slow learners" or "educable mentally retarded." The students came from low income homes, with the majority of the families receiving public assistance payments.

Spanish bilingual classes had been in existance for three years in this community. Most of the older students had English language instruction in the earlier grades. The younger children (second and third grades) had been in Spanish language classes from the start of formal schooling and were learning English as a second language.

Instruments

1. Learning Potential assessment. Raven Progressive Matrices, Sets A, AB, B (1956) were group administered in Spanish prior to and following the group administered training procedure offered in one 45-minute session. The training procedure explained and demonstrated principles appropriate to pattern completion,

orientation of complex elements in a design, and double classification problems, which are the most readily identifiable problem types in these problem sets. Corman and Budoff (in press) have confirmed that these problems are distinct types. A training booklet which contained nontest problems dealing with these types was distributed to each child. The trainer presented the problems on 2 X 2 slides from a Kodak Carousel projector on a blackboard. The students were required to draw in the missing element for the design before they looked at the six choices presented on the lower half of the page. This procedure was particularly useful in helping these children understand the double classification problems. During development of the procedure, it was found that children could easily derive one attribute at a time, but often did not hold the first attribute in mind while they derived the second relevant attribute. The child's understanding was facilitated by having him draw the relevant attributes, one at a time, as he derived them. This procedure helped concretize the elements of the solution process so that many children, after this type of practice, could do the double classification problems mentally with very little trouble.

The requirements of each problem type were presented in meaningful designs initially, e.g., an American flag with a piece missing, and then a geometric form to attune the child to the basic format of the Matrices test problems. Individual children were called to indicate the correct choice, and to give reasons for their choice. A slide with the answer included allowed them to compare their choice and to correct it, if necessary. A manual in Spanish translation with the instructions and procedures is available (Gimon, Budoff, & Corman, 1974).

2. The Semantic Test of Intelligence (STI) was group administered to all students with the standardized procedures developed by Rulon and Schweiker (1953).

necessary instructions were given in Spanish. The STI is a language-related measure which uses geometric symbols to represent a pictured object or action as an analogue to reading words in a sentence. It is administered as a timed test and consists of 217 items, including 109 items with one symbol, 49 with two symbols, 36 with three symbols, and 23 with four symbols. The symbols for each noun and verb are introduced as single symbols, and defined by accompanying pictures in a multiple choice format on tuition pages which are not scored. Tuition pages are used to introduce 2-, 3-, and 4-symbol "sentences." Instructions are pantomimed. The symbols and the pictures which define their meaning are presented on each double page so that memory for the meaning of the symbol is not a factor influencing performance.

The STI was originally developed as a measure of military trainability with illiterate recruits who had failed the literacy requirement for entry into the Marine Corps. Validity of this test as a language-related measure has been evidenced by Rulon and Schweiker's (1953) finding that recruits who did well on the STI also successfully completed a literacy course to meet the eligibility requirements of the Marine Corps. Proficiency on this training-based language-related task, more than WISC vocabulary scores was hypothesized to relate to the child's verbal competence in explaining the reasons for his empirical understanding of electricity.

3. WISC IQ. The students were individually tested on the WISC performance subtests in Spanish and the WISC vocabulary subtest in Spanish and English, Puerto Rican version (1954) and scores were prorated to provide an estimate of verbal IQ.

Electricity Unit

All students participated in the electricity course as adapted by Budoff,

and Meskin, 1970. This unit teaches simple concepts of electricity by having the child experiment with his own equipment (flashlight batteries, bulbs, and various types of wire) and draw conclusions based on the results of his observations of these experiments. The unit employed earlier was translated and taught in Spanish. All workbook materials were in Spanish. The classes consisted of 10 to 12 students, grouped by grade level, and were conducted during two 45-minute sessions a week for a seven-week period. Electricity classes were organized following completion of the IQ and LP testing.

Children learned what a simple circuit is and what requirements are necessary for making a bulb light. They studied the results of varying amounts of voltage and amperage in an elementary way by making and observing different circuits with bulbs and batteries arranged in series or in parallel circuits. They noted the effects of resistance in wires of different materials, lengths, and thicknesses, and in different kinds of bulbs. Conductors and insulators, both solid and liquid, were observed. Lessons in diagramming with electrical symbols were included in the unit. Language was kept simple--the children learned few formal electrical terms, and formal explanations of concepts such as electrical resistance were minimized. No attempt was made to offer a comprehensive theory of electricity. A description of the course and the teacher's manual and student's workbook are presented in Budoff and Meskin (1970).

Electricity Evaluation Instrument

Before and after participation in the electricity unit, all students were given an instrument developed to evaluate their understanding of electricity (Budoff & Meskin, 1970). The test was designed to permit responses at a concrete and abstract level in minimally and maximally verbal response modes. The concrete level of the minimally verbal section of the test consisted of actual electrical

setups mounted on masonite pegboards. This presentation of materials, made familiar by the course, increased the child's opportunity to demonstrate empirically his comprehension of the concepts of electricity. The symbolic level of the minimally verbal section presented problems as diagrams which looked like the setups (realistic), and as schematic diagrams, to test the child's ability to apply his acquired knowledge in more abstract presentations. The symbols presented in the schematic diagrams were learned in the course and were explained in the test booklet. The pegboards section was administered individually, and the diagrams section in groups.

The verbal section of the test required subjects to explain their answers to 16 selected questions on the pegboard section. These answers permitted an evaluation of the subject's ability to verbalize his behaviorally demonstrated understanding. Answers were scored for two levels of response: the verbal descriptive level, which represented the child's ability to describe the salient characteristics of the circuit, and the verbal conceptual level, which indicated the student's causal understanding of why a particular bulb would or would not light.

Four scores were obtained for each student on both the pre- and posttesting test: one for each level of response within the minimally and maximally verbal response modes. Scores on the pegboards (concrete level) and diagrams (symbolic level) were number correct. The total score possible on the pegboards was 60 and on the diagrams was 62. Each of the 16 verbal explanations was scored on a 4-point scale so that the total possible score for each verbal level was 64.

Results

The means and standard deviations for the WISC PIQs were in the average range (93.2 ± 16). The prorated means for the WISC verbal IQ was 81.5 (± 21)

and 50.6 (± 18), for the Spanish and English administrations, respectively. The mean Semantic Test of Intelligence score was 155.2 (±41.9). The Raven scores increased with training, from 21.2 (± 7.6) to 25.1 (± 7.1)

The pre- and postest means for electricity test scores presented in Table 1 indicate the students did know more about the application of the principles of electricity after the course.

Insert Table 1 about here

Predictors of Postteaching Performance on Electricity Instrument

Four stepwise multiple regression analyses on postteaching scores on the electricity instrument were performed to test the relative predictive power of Learning Potential and IQ scores on each level of response. The independent variables were posttraining Raven score, pretest score on the electricity measure, WISC Performance IQ, WISC Spanish Vocabulary, WISC English Vocabulary, Semantic Test of Intelligence score, age, and sex. These four regression analyses were repeated with pretraining Raven scores substituted for post-training Raven scores to compare the predictive power of these two scores on the criterion variables. In all regression analyses, the order of entry of independent variables into the equations was determined by the amount of variance accounted for by each variable.

Posttraining scores on the learning potential procedure significantly predicted postteaching diagram scores, the minimally verbal test of symbolic electrical knowledge (See Table 2). By contrast, the students' scores on three IQ measures, i.e., pretraining Raven, WISC Performance IQ and WISC Spanish vocabulary scores did not significantly predict any of the four postteaching

TABLE 1

Means and Standard Deviations on Electricity Measures

	Pretest		Posttest	
	$\bar{X}$	SD	$\bar{X}$	SD
Minimally verbal mode				
Pegboards (concrete)	30.98	7.02	49.56	3.09
Diagrams (symbolic)	17.74	6.28	44.93	8.22
Verbal mode				
Descriptive reasoning	15.67	5.53	40.17	5.92
Conceptual reasoning	8.65	4.09	28.48	7.18

electricity scores. This finding supported the hypothesis: after LP training had provided the experiential knowledge and skills which these low income, linguistically different students lacked, posttraining LP scores were better predictors of success on the curriculum unit than IQ scores.

Insert Table 2 about here

The Semantic Test of Intelligence score which was hypothesized to relate to the verbal explanation scores, significantly predicted postteaching scores only on the pegboard section (the minimally verbal concrete measure), and did not relate to either verbal score. The sign of the beta weight for STI in this equation was negative. It is likely that the STI functioned as a suppressor variable: it was highly positively correlated with WISC performance IQ but correlated zero with the posttest pegboard score.

English WISC vocabulary score was significantly and negatively related to verbal conceptual reasoning. That is, the lower the facility the students had in English vocabulary, the higher their conceptual reasoning in Spanish, as indicated by their ability to provide reasons for their empirical understanding of a problem.

Sex was not a significant predictor of any of the four criterion measures. Age was a negative predictor of minimally verbal symbolic, verbal descriptive, and verbal conceptual scores. Younger students scored higher on these measures than older students.

Improvement Following Electricity Instruction

To determine change in performance following participation in the electricity unit, scores on the two modes of response (minimally and maximally verbal) were submitted to separate repeated measures analyses of variance. In each analysis,

TABLE 2

T-Tests of Independent Variables in Multiple Regressions on Postteaching Electr

	Dependent variables					
	Minimally verbal mode				Verb	
	Pegboards (concrete)		Diagrams (symbolic)		Descriptive reasoning	
Independent variables	Beta weight	t-value	Beta weight	t-value	Beta weight	t-value
Electricity pretest	.463	3.17**	.348	2.65*	.244	1.69
Age	-.254	-1.66	.446	-3.47**	-.437	-2.72**
Posttraining Raven	.052	0.36	.391	2.93**	.138	0.84
WISC performance IQ	.354	1.77	-.025	-0.14	-.025	-0.11
WISC Span. vocab.	.264	1.48	-.038	-0.23	.104	0.51
WISC English vocab.	-.064	-0.46	.016	0.12	.051	0.32
Sex	-.082	-0.56	.047	0.35	.045	0.57
STI	-.329	-2.03*	.045	0.27	-.145	-0.77
r^2	.377		.462		.190	
F (df = 3/45)	3.40**		4.83***		1.32	

*p <.05

**p <.01

***p <.001

TABLE 2

Independent Variables in Multiple Regressions on Postteaching Electricity Scores

Dependent variables							
Minimally verbal mode				Verbal mode			
Pegboards (concrete)		Diagrams (symbolic)		Descriptive reasoning		Conceptual reasoning	
Beta weight	t-value	Beta weight	t-value	Beta weight	t-value	Beta weight	t-value
.463	3.17**	.348	2.65*	.244	1.69	.086	0.69
-.254	-1 66	.446	-3.47**	-.437	-2.72**	-.574	-4.20***
.052	0.36	.391	2.93**	.138	0.84	.238	1.67
.354	1.77	-.025	-0.14	-.025	-0.11	-.001	-0.00
.264	1.48	-.038	-0.23	.104	0.51	-.107	-0.60
-.064	-0.46	.016	0.12	.051	0.32	-.299	-2.16*
-.082	-0.56	.047	0.35	.045	0.57	-.075	-0.52
-.329	-2.03*	.045	0.27	-.145	-0.77	.049	0.30
.377		.462		.190		.386	
3.40**		4.83***		1.32		3.54**	

the between-subjects factor was Sex, and the two within-subjects factors were Test Session (pre- and postteaching) and Test Level (i.e., concrete and symbolic for the minimally verbal mode and descriptive and conceptual for the verbal mode).

The results of these analyses are presented in Tables 3 and 4 for each response mode. The significant main effect for Test Session in both analyses showed highly significant gains from pre- to posttest for both modes of response ($F = 682.16$, $df = 1/52$, $p < .001$ for the minimally verbal mode; $F = 514.21$, $df = 1/52$, $p < .001$) for the verbal mode). Significant differences in levels of response competence within each mode were also obtained: across test sessions scores on the concrete level were higher than on the symbolic level, and descriptive scores were higher than conceptual scores (Table 1). The effects of Sex and interactions involving Sex were not significant in either analysis.

Insert Tables 3 and 4 about here

Significant Test Session X Test Level interactions were obtained for both modes. Lindquist's (1956) test of critical differences between means on the two minimally verbal levels showed that, while pretest scores on the concrete level were higher than on the symbolic level, scores on the two levels did not differ markedly after teaching. The means in Table 1 indicate that, following teaching, scores on the pegboards approached a ceiling and showed little variability. This finding indicated mastery of the concrete mode by most students after participation in the electricity course. A more marked increase in competence was evident on the symbolic mode. These results confirmed earlier findings of Budoff, et. al., (1971) which indicated a generalization of effect from the concrete pegboard format to the schematic diagrams and a significant consistency of response from one format to the other following teaching.

TABLE 3

Repeated Measures ANOVA on Minimally Verbal Electricity Scores

	SS	df	MS	F
Sex	28.45	1	28.45	0.46
Unit	3233.88	52	62.19	---
Test Level (concrete vs symbolic)	4343.48	1	4343.48	91.37*
Sex X Test Level	55.61	1	55.61	1.17
Test Level X Unit	2471.92	52	47.54	---
Test Session (pre-post)	27013.54	1	27013.54	682.16*
Sex X Test Session	21.78	1	21.78	0.55
Test Session X Unit	2059.19	52	39.60	---
Test Level X Test Session	1057.34	1	1057.34	63.89*
Sex X Test Level X Test Session	59.19	1	59.19	3.58
Test Level X Test Session X Unit	860.52	52	16.55	---
Total	41204.88	215	191.65	

*p <.001

TABLE 4

Repeated Measures ANOVA on Verbal Electricity Scores

	SS	df	MS	F
Sex	7.06	1	7.06	0.14
Unit	2650.48	52	50.97	---
Test Level (descriptive vs conceptual)	4466.03	1	4466.03	199.89*
Sex X Test Level	14.48	1	14.48	0.65
Test Level X Unit	1161.84	52	22.34	---
Test Session (pre-post)	25661.91	1	25661.91	514.21*
Sex X Test Session	0.42	1	0.42	0.01
Test Session X Unit	2595.08	52	49.90	---
Test Level X Test Session	304.44	1	304.44	24.15*
Sex X Test Level X Test Session	10.44	1	10.44	0.83
Test Level X Test Session X Unit	655.56	52	12.61	---
Total	37527.73	215	174.55	

*$p < .001$

Testing the differences between the means for the two verbal levels showed that the students were more competent in describing the characteristics of the circuits than they were in providing causal explanations for the electrical phenomena. Both the mean pre- and postteaching scores on description were higher than the corresponding means on conceptual expression. The significant Test Session X Test Level interaction indicated that the mean increase from pre- to posttest was greater on descriptive than on conceptual reasoning (Table 1); however, the fact that the students' ability to verbalize reasons for their choices at both levels increased markedly indicated that they had little difficulty at either level of performance in their native language.

Discussion

Optimizing the manner in which measures of general ability to profit from experience, i.e., intelligence, are administered, shows promise of providing a less biased indicator of general ability among Spanish-speaking students than that given by the traditional intelligence tests. The Spanish version of the WISC IQ test, given in the traditional, single administration format, revealed the usual finding that many of these students perform in the dull normal range. This finding was particularly evident for their verbal IQ even when administered in Spanish. Clearly these students are not competent when their spontaneous productions on school-oriented language or problem-solving tasks are used as the basis for estimates of intelligence. But these estimates reflect the difference in their language, as well as the difficulties low income students, regardless of linguistic or cultural background evidence when confronted with the middle class style of reasoning problems in tests, and presumably, in school.

By contrast, the learning potential procedure which shows these low income Spanish-speaking students how to perform more effectively on a reasoning task

in a competence-inducing context, results in higher levels of performance on the reasoning task and predicts their ability to profit from the electricity curriculum. This finding provides additional direct educational validity for the efficacy of a training based assessment as embodied in the learning potential procedure. Budoff, et al., (1974) demonstrated that posttraining LP scores, as well as WISC performance IQ scores presented in Spanish and English, did correlate with nonverbal and numeric achievement test scores. Verbal IQ predicted only verbal achievement in the same language. Achievement measures, however, tend to reflect the poor scholastic attainment of these students and are poor evidence of potential ability to learn under more suitable circumstances. The electricity unit, like the LP procedure, permitted these students to display their reasoning capability in situations not adversely affected by their prior poor achievements in school. After participation in the unit, students demonstrated marked improvement in both minimally verbal and verbal modes of response.

Validity of the LP procedure was indicated by the finding that posttraining LP scores were significantly related to performance on the minimally verbal symbolic level of the electricity evaluation instrument, whereas IQ scores were not positively related to any electricity scores attained following participation in the electricity unit, partially confirming the hypothesis. The finding that posttraining LP scores did not significantly predict postteaching scores on the concrete level of the electricity instrument reflects the ceiling and low variability of students on that section of the test. That is, after instruction, most students demonstrated mastery on the concrete level.

The expectation that postteaching verbal scores on the electricity instrument would be related to scores on the Semantic Test of Intelligence, a language-related training-based measure was not borne out by the results of this study. Students

above the third grade level attained a ceiling on the test. While this test may possess validity with illiterate adults (Rulon & Schweiker, 1953) its usefulness with children spanning a broad age range would appear limited.

The finding that younger children attained higher postteaching scores on three of the four electricity measures is inconsistent with results of many studies, and may be attributed to the fact that all materials, discussion, and test administrations were conducted in Spanish. The older students in this sample had spent their primary grades in English-speaking classrooms. Also, they ranged in age to 15 years but were still attending a grade school. They may have been "turned off" to new learning situations, however stimulating. The younger students had been taught mainly in their native language since they started school. Their ability to express in Spanish an adequate verbal explanation for their nonverbal choice may reflect greater comfort and adequacy in their native language. This reason may also explain the negative relationship between English vocabulary scores and conceptual reasoning in Spanish; i.e., that relationship is probably stronger for the younger students.

Scores of this sample on a traditional IQ test indicated that these students' aptitude for academic tasks was low and that low school achievement could be expected. From these scores the inference is commonly made that they are less intelligent, i.e., they cannot perform more adequately. One major response to this clearly discriminatory judgment has been to restandardize the traditional IQ and achievement tests so they will normatively reflect the scores of low income and/or bilingual students (Mercer, 1972; Diana v. State Board of Education, 1970). But lowering the norms will only lower the expected level of performance, which will be reflected in a lower level of educational stimulation and challenges accorded these children. The result will be a de facto outcome that they are

less able because their educational attainments are low. Lowering the raw score norms will reduce the incidence of mislabeling as mentally retarded, but will fail to close the gap between the child's acquired competencies and the deficiencies perceived by the school, and by extension, the society (Meyers, 1973).

A training-based assessment shows promise of providing a culture fair assessment of ability to profit from experience and meeting these objections. The criterion of adequate performance is maintained because the posttraining scores are evaluated in the context of the child's normative age group for the general population. But the recognition that low income and/or non-English-speaking children suffer considerable handicaps in responding to the test problems has resulted in a significant reorientation in the testing procedures. Training, i.e., helping the students to perform more effectively on the reasoning problems, enables the capable student to reorient his problem-solving abilities to the demands of middle class biased procedures. Further, embedding the test within this competence-enhancing learning situation helps the child who expects to fail cope with the anxiety generated by the test situation.

The educational implications of these findings should be clear. Many of these children are intellectually competent but the conditions must be structured for them in light of their prior cognitive history, and their present functioning styles. Especially for children who are marginally adequate achievers in classes conducted in a language and a culture foreign to them, curricula must be presented in the modalities that will tap these children's learning strengths. These curricula would tend to mitigate the failure set that low achievers tend to develop by enhancing their sense of competence in school. Manipulative, experiential learning units are often dismissed as irrelevant to the needs of problem

learners because they do not foster improved literacy. However, they do engage these children in constructive learning. This provides a set of common experiences within a classroom that can be utilized for active language exchanges and for experienced-based reading materials. Talking about what they are learning by their own active efforts provides a basis for communications that should enhance these lower class students' ability to use language as an instrument of analysis and synthesis in problem solving. It is this relative failure that characterizes the major source of the verbal deficits among lower class students, when contrasted with children from middle class homes (Bruner, 1971).

This educational strategy is premised on the fact that their teachers will regard them as more able, and that they will structure programs appropriate to more adequate learners. The particular contribution of the training-based assessment score, LP, in contrast to the low IQs, is the demonstration that these students are often more intellectually competent than is generally assumed.

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Footnotes

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